XXII Encontro Luso-Galego

Química

9 a 11 novembro 2016

Instituto Politécnico de Bragança | BRAGANÇA - PORTUGAL

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Adsorption of Sudan IV from oily wastewater by using modified activated carbon materials

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A commercial activated carbon (AC: Norit ROX 0.8, D = 0.8 mm) was modified by chemical and thermal processes, following the procedures described elsewhere [1]. The materials were tested as adsorbents for the removal of a lipophilic pollutant, Sudan IV (S-IV), using a biphasic medium (water/cyclohexane) in order to simulate contaminated petroleum mixtures with water [2]. The AC was modified in successive steps considering: (1) grinding and sieving (< 250 µm) and (2) treatment with nitric acid, followed by hydrotreatment with urea and thermal treatment at 800 ºC under inert atmosphere, resulting in the adsorbents PAC and PACNAUT, respectively. Adsorption experiments were performed in a 500 mL batch glass reactor, using 2.5 g of adsorbent per litre of organic phase, 2.5 g/L_{OP}. Fig.1A shows results with different particle size (p_s), initial S-IV concentration ($C_{S\text{-}IV,0}$) and AC modifications. As expected, it can be observed that adsorption is faster when p_s is smaller. However, the powdered activated carbon (PAC) is not able to adsorb all S-IV in high initial concentration (500 mg/L). This target was achieved with PACNAUT (adsorption of S-IV was 90 % at 1 h and 2.5 g/L_{OP} of adsorbent, higher than the removal observed by other authors [2] at the same time and 4 g/L_{OP} of material). The adsorption kinetics was fitted by a pseudo-second-order model to the data obtained with 500 mg/L of $C_{S\text{-}IV,0}$ (Fig. 1B). PACNAUT has higher adsorption capacity (q_e) and rate constant (k_S).

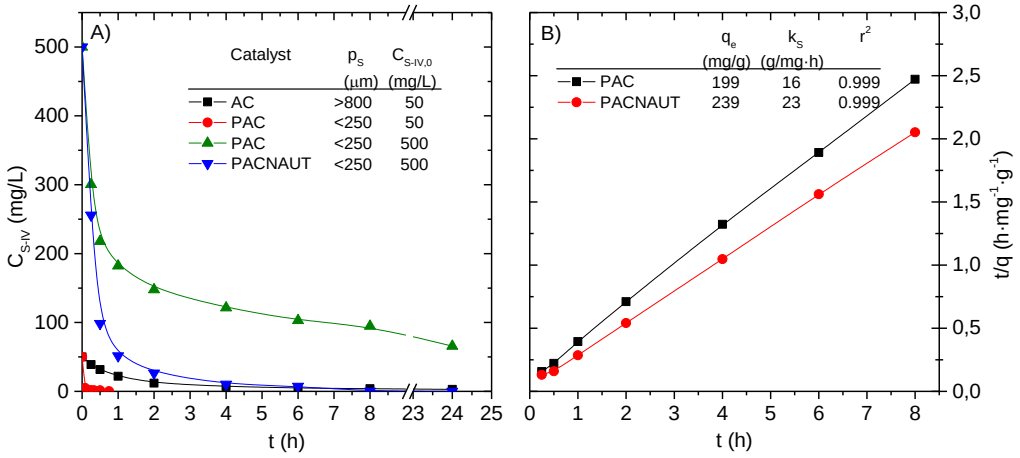

Fig.1. Removal of S-IV in runs performed with different p_s, $C_{S\text{-}IV,0}$ and adsorbents (A) and kinetic model fitted for the experiments carried out with PAC and PACNAUT materials at $C_{S\text{-}IV,0}$ = 500 mg/L (B).

Acknowledgments
This work is a result of project "AIProcMat@N2020 - Advanced Industrial Processes and Materials for a Sustainable Northern Region of Portugal 2020", with the reference NORTE-01-0145-FEDER-000006, supported by NORTE 2020, under the Portugal 2020 Partnership Agreement, through the ERDF and of Project POCI-01-0145-FEDER-006984 – Associate Laboratory LSRE-LCM funded by ERDF through COMPETE2020 - POCI – and by national funds through FCT. This work was financially supported also by FCT Investigator 2013 Programme (IF/01501/2013), with financing from the European Social Fund and the Human Potential Operational Programme.

References
[1] R.S. Ribeiro, A.M.T. Silva, J.L. Figueiredo, J.L. Faria, H.T. Gomes, Applied Catalysis B: Environmental, 140-141 (2013) 356.
[2] A.A.S. Oliveira, I.F. Teixeira, T. Christofani, J.C. Tristão, I.R. Guimarães, F.C.C. Moura, Applied Catalysis B: Environmental, 144 (2014) 144.